C/C Manufacturing with MG Resin and 3D Preforms, Phase I

Completed Technology Project (2018 - 2019)

Project Introduction

Cornerstone Research Group Inc. (CRG) proposes to advance the state-of-the-art in carbon/carbon (C/C) composites for hot structures on atmospheric entry vehicles with an objective to deliver high quality components quicker and at lower cost. This is enabled by a new, proprietary resin technology called MG Resin. The material is being explored through funding with DARPA, MDA, NASA, and the Army for a range of applications including hot structures, thermal protection systems (TPS), and rocket motor insulation among others. The proposed embodiment uses MG Resin to replace phenolic or pitch as the primary char former in C/C and as a reimpregnation resin. MG forms graphitic carbon at relatively low temperatures with very high yield and it can be processed with liquid infusion techniques, resin film infusion, or in prepreg formats. Densification is still required, but CRG is targeting one or two reimpregnation steps as opposed to the six or more that serve as the current state of the art. The time and cost savings afforded by the reduced number of impregnation steps is significant with applicability for many different types of C/C and their related applications spanning aeroshells, control surfaces, and propulsion.

Anticipated Benefits

High Temperature Composites

*Aircraft Engine Components, *Control Surfaces, *Nozzles, *Fins

Thermal Protection (TPS)

*Leading Edges, *Control Surfaces, *Nose Cones, *Hypersonics, *Aeroshells

Fire Smoke and Toxicity Compliant Materials

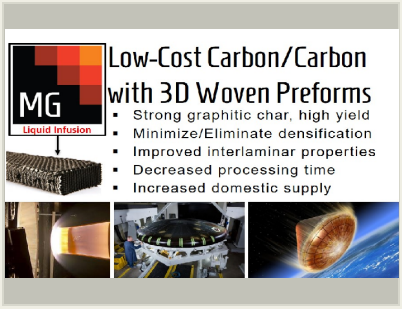
*Aircraft interiors, *Marine interiors

Automotive

*Engine, *Exhaust, *Brake pads

Energy Industries

* Turbines, *Diesel Generators, *Fuel Cells, *Transformers, *Batteries



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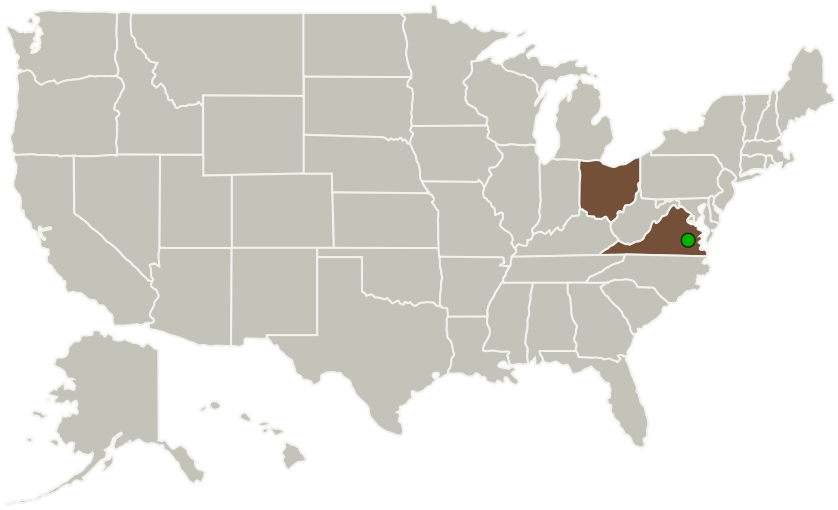
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Cornerstone Research Group, Inc.	Lead Organization	Industry	Miamisburg, Ohio
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Ohio	Virginia

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141292)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Cornerstone Research Group, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

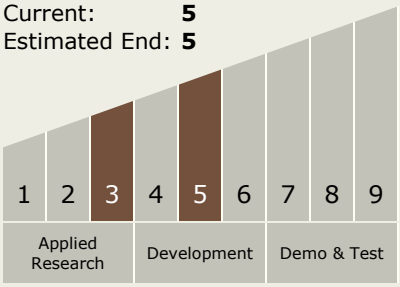
Carlos Torrez

Principal Investigator:

Richard D Hreha

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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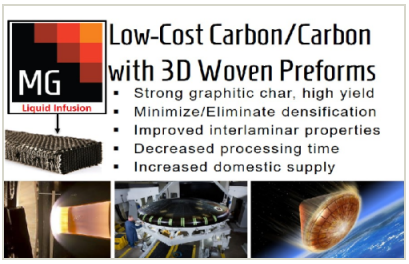
Images



Briefing Chart Image
C/C Manufacturing with MG Resin and 3D Preforms, Phase I *(https://techport.nasa.gov/image/135161)*

Final Summary Chart Image
C/C Manufacturing with MG Resin and 3D Preforms, Phase I *(https://techport.nasa.gov/image/127736)*

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.1 Manufacturing Processes

Target Destinations

Earth, Mars